

Rovers roll in extended mission

By Guy Webster

Image mosaic from Opportunity's panoramic camera from approximately 70 meters (about 230 feet) from the rim of "Endurance Crater" on the rover's 93rd sol on Mars, in late April. The foreground highlights the now-familiar ripples and dimples, common on the plains of Meridiani Planum.

Both of JPL's Mars Exploration Rovers have completed their originally planned mission and are tackling extra-credit assignments. "Spirit and Opportunity have completed all the primary objectives of the mission," said Orlando Figueroa, director of the Mars Exploration Program at NASA Headquarters. "The terrific success achieved is a tribute to a superb team whose commitment to excellence, and keeping the public engaged, is hard to match."

Opportunity finished its 90th martian day of surface operations on April 26. That was the last of several criteria set in advance for full mission success. Spirit passed its 90-day mark on April 5. Both rovers have met all goals for numbers of locations examined in detail, distances traveled, and scientific measurements with all instruments. Both rovers are healthy. In early April, NASA approved funding for extending operation of Spirit and Opportunity through September.

"This brings Opportunity's primary mission at Meridiani Planum to a resounding and successful close. It's stunning to think through the short history of this vehicle," said Matt Wallace, Opportunity mission manger at JPL, where rover assembly began barely two years ago. In its three-month primary mission, Opportunity drove 811 meters (more than half a mile) and sent home 15.2 gigabits of data about Mars, including 12,429 images.

Opportunity found other rock exposures in late April similar to the ones near its landing site that yielded evidence for a body of salty water covering the area long ago. Instead of spending many days to examine those rocks, controllers told the rover to go to the rim of a 130-meter-wide (approximately 430-foot-wide) crater informally named "Endurance."

When Opportunity sends home a view into Endurance Crater, scientists and engineers will begin deciding whether the rover should try to enter that crater. "We're coming up on a major branch point in the mission," said Dr. Scott McLennan of the State University of New York, Stony Brook, a member of the rovers' science team. "Can we get down into Endurance? Can we get back out?"

In mid-April, Opportunity paused beside a crater dubbed "Fram," less than one-tenth the size of Endurance Crater. It examined a rock

studded with small, iron-rich spherules that are one part of the evidence for past water in the region. The rover used its rock abrasion tool to grind a hole. This allowed examination of the interior of the rock, called "Pilbara."

McLennan said, "Pilbara is a dead ringer for McKittrick," a rock target in the outcrop Opportunity examined in February and March. Another rock at Fram showed hints that it might provide the best-yet evidence about how minerals precipitated out of solution as the ancient body of water evaporated. "It's something that would be of interest to come back and study more if we don't see something of even greater interest along our way," he said. Images of Endurance Crater from a distance seem to show much thicker layers of outcrop than Opportunity has been able to reach so far.

Improvement to the rovers' mobility from new software has expanded options for planning their explorations. Spirit and Opportunity drove farther in April than in the previous three months combined. As of the end of April, Spirit has traveled more than 1.2 kilometers (three-fourths of a mile), and has another 1.8 kilometers (more than a mile) to go before reaching highlands informally named "Columbia Hills." Scientists hope to examine rock layers older than the volcanic plain Spirit has been crossing. In late April, Spirit crossed from an area dominated by material dispersed by crater-forming impacts into an area with fewer rocks.

"We are transitioning into a geologically different region. Nothing could be more striking evidence of this than the view ahead of a landscape that has fewer and smaller rocks than the region explored so far," said Dr. Dave Des Marais, a rover science team member from NASA Ames Research Center, Moffett Field, Calif. Scientists are using Spirit's observations at ground level to check ideas about the region's geology based on observations from orbiting spacecraft. That could improve interpretation of orbital data for the whole planet. Spirit will systematically survey the soils, rocks and other features on the plain as it continues toward Columbia Hills, with arrival planned for mid to late June.



Kids have their day

About 650 children of JPL staff came out to the Laboratory for "Take Our Daughters and Sons to Work Day" on April 22. JPL photographer Tom Wynne's daughter, Alice, took her turn with the camera and caught youngsters enjoying a rover prototype rolling over them (below). She also captured a group (above right) enjoying the von Kármán visitor center museum. Meanwhile, dad Tom took an image of Kevin Criddle of Section 312B and his daughter Sandra. Criddle stood in for the Cassini solar blanket in Richard Shope's pantomime demonstration.



News Briefs

Beck video takes NASA award

Producer JOHN BECK of JPL's Media Relations Office recently earned honors in NASA's Videographer of the Year awards.

Beck's production "Six Minutes of Terror," which depicted the Mars Exploration Rovers' entry, descent and landing phase using a fast-paced mix of project personnel describing the action along with animation, won first place in the "Public Affairs Office" category.

Award judges included Academy Award-winning editor Dan Hanley. The winners were announced at an April meeting of the National Association of Broadcasters Media Show in Las Vegas. Other categories that were recognized were Production and Documentation.

The video is available online at <http://marsrovers.jpl.nasa.gov/gallery/video/challenges.html>. Check under the heading "Entry, Descent and Landing."



John Beck captured first-place honors for his video.

Published paper probes pulsar pair

The only known gravitationally bound pair of pulsars—extremely dense, spinning stars that beam radio waves—may be pirouetting around each other in an intricate dance.

"Pulsars are intriguing and puzzling objects. They pack as much mass as the Sun crammed into an object with a cross-sectional area about as large as Boston," said FREDRICK JENET of JPL. Jenet and SCOTT RANSOM of McGill University in Montreal have developed a theoretical model to explain the behavior of this one-of-a-kind set of pulsars.

"The physics of radio pulsar emission has eluded researchers for more than three decades," Jenet said. "This system may be the 'Rosetta Stone' of radio pulsars, and this model is one step toward its translation."

The research appears in the April 29 issue of the journal Nature. Jenet and Ransom studied the recently-discovered double pulsar system, in which two spinning pulsars orbit each other.

The discovery of the two-star system, officially named PSR J0737-3039B, was announced in 2003 by a multinational team of researchers from Italy, Australia, the United Kingdom and the United States. Those researchers proposed that the duo contained one spinning pulsar and a neutron star.

Later in 2003, scientists working at the Parkes Observatory in New South Wales, Australia, determined that both stars are actually pulsars. This discovery marked the first known example of a "binary," or double, pulsar system. The stars are referred to as A and B.

Pulsars emit high-intensity radio radiation into a narrow beam. As the pulsar rotates, this beam moves in and out of our line of sight. Hence, we see periodic bursts of radio radiation. In this sense, a pulsar works like a lighthouse, in which the light may be on all the time, but it appears to blink on and off. Scientists were surprised to find that the B pulsar is on only at certain locations in its orbit. "It's as though something is turning B on and off," Jenet said.

According to Jenet and Ransom, this "something" is closely related to the radio emission beam emanating from the A pulsar. They believe that B becomes bright when it is illuminated by emission from A. Jenet and Ransom used Einstein's Theory of General Relativity to predict the future evolution of this pulsar system. The theory implies that gravitational effects will change the emission pattern of A, which will then alter the exact orbital locations where B becomes bright.

The double pulsar system is located about 2,000 light-years, or 10 million billion miles, from Earth. Jenet and Ransom based their research on observations made at the Green Bank Telescope in West Virginia.

Space Place site is revamped

The award-winning, educational Web site Space Place has been revamped to make it even more out of this world. The site targets elementary school children, their parents and teachers. The new design makes it even easier for kids to stay in touch with fun facts about space.

All the projects on Space Place integrate the inspirational work of NASA and JPL into interactive games, puzzles and animations for kids.

Webmaster DIANE FISHER said the site covers 32 current and past JPL missions and studies. Each contains its own educational lesson.

For example, kids can "Blast Off for a Mars Adventure," solve gravitational waves crosswords, or make their own Star Finder to help them locate constellations. The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) game shows them the difference between infrared and visible light.

If Web visitors get hungry, there are simple recipes for asteroid potatoes or Moon cookies.

The new Space Place site helps students learn all about the solar system, stars, Earth sciences and technology. A version of the site is also available in Spanish.

Fisher said site visitation has grown to average about 10,000 unique visits a day.

To see the new and improved Space Place, visit <http://spaceplace.nasa.gov>.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (the Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Group—Meets the first Friday and third Thursday of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parents Group for Children With Special Needs—Meets the second Thursday of the month at noon in Building 167-111 (the Wellness Place).

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111. For more information, call the Employee Assistance Program at ext. 4-3680.

Friday, May 7

"Asian Americans Front and Center: Making Sure Our Voices Are Heard"—Ted Chen, an anchor and reporter for the Channel 4 News, will open Asian Pacific American Heritage Month with a talk at noon in Building 180-101.

Saturday, May 8

Bandorama—The Caltech Concert and Jazz Bands' 26th annual concert will be presented at 8 p.m. in Beckman Auditorium. Featured will be Chris Renk, winner of the Caltech competition for new music for concert band. The concert band will also play a medley of songs from *La Bohème* and the jazz bands will perform Big Band music. Free admission. A reception will follow the concert. For more information, call (626) 395-4652.

Monday, May 10

"How We Might Have Gone to Mars in 1965: The Story of Project Orion"—Dr. Freeman Dyson, Professor Emeritus at Princeton Institute for Advanced Study and Distinguished Visiting Scientist at JPL, will speak at 10:30 a.m. in von Kármán Auditorium. The talk is part of the Director's Topical Seminar Series.

Tuesday, May 11

JPL Stamp Club—Meeting at noon in Building 183-328.

SQI Seminar Series—Alan Ferdman, team leader in the Software Assurance Group of the Quality Assurance Office, will present "Is Your Software Project On Track? How Can You Tell?" at noon in conference room 167. Ferdman will discuss how software tasks can be monitored and controlled in a way that prevents surprises and leads to consistent success.

Wednesday, May 12

"Computational Design Synthesis: Opportunities, Models and Applications"—Dr. Jonathan Cagan, professor of mechanical engineering at Carnegie Mellon University in Pittsburgh, will speak at 9 a.m. in conference room 167. The talk is presented by JPL's Center for Space Mission Architecture and Design.

Investment Advice—TIAA/CREF will offer a workshop in Building 180-101 from 9 to 10:30 a.m. that focuses on how a Supplemental Retirement Annuity offers an easy, affordable and tax-deferred way to build the additional assets needed to supplement your retirement plan and Social Security benefits. While your retirement plan and Social Security provide a good foundation, they are not likely to be

enough for the type of retirement lifestyle most employees really want.

JPL Amateur Radio Club—Meeting at noon in Building 238-543.

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Debbi Llata at ext. 4-8374 for information.

TIAA/CREF Enrollment Meeting—This workshop, held at noon in Building 249-114, is designed to assist employees newly eligible for the Caltech/JPL retirement plan with selection of investment options and the completion of enrollment forms.

Friday, May 14

Investment Advice—Fidelity will offer one-on-one counseling in Building 249-114. For an appointment, call (800) 642-7131.

Sunday, May 16

"The Nigerian Spam Scam Scam"—Actor/comedian Dean Cameron will perform at 2 p.m. in Caltech's Baxter Lecture Hall in this Skeptics Society-sponsored event. Donations: \$5 for members, \$8 for nonmembers, free for the JPL/Caltech community. For more information, call (626) 794-3119.

Monday-Tuesday, May 17-18

Investment Advice—TIAA/CREF will offer one-on-one counseling in Building 249-114. For an appointment, visit www.tiaa-cref.org or call (877) 209-3140, ext. 2614.

Tuesday, May 18

Annual Investment Review Workshop—Fidelity will present "Investing Your Retirement Account in a Changing Market" from 2:30 to 4 p.m. in Building 180-101. Roland Jacobs, vice president of Fidelity Investment Consulting, will review economics and markets, historical mutual fund performance, and advanced asset allocation principles. Seating is limited. Call Fidelity at (800) 642-7131 to reserve your space.

Tues.-Wed., May 18-19

Blood Drive—Held in von Kármán Auditorium from 10 a.m. to 4 p.m. Tuesday and from 7 a.m. to 1 p.m. Wednesday. Advance signup sheets are available at JPL Occupational Health Services, Building 310-202, prior to the blood drive, or sign up online at <http://www.givelife.org/index.cfm?hcl=JPL>. Enter your e-mail and birthdate; "JPL" is the sponsor code. For last-minute signups, or to change your appointment, call the Red Cross at (626) 960-6956, ext. 225.

Wednesday, May 19

"The Evolution of Human Skin Coloration"—Anthropologist Nina Jablonski will lecture at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$12. For more information, call (626) 395-4652.

Thursday, May 20

Clogging Class—Meeting at noon in Building 300-217. For more information, call Shary DeVore at ext. 4-1024.

Thu.-Fri., May 20-21

Von Kármán Lecture Series—Nagin Cox, deputy team chief on the Mars Exploration Rover Project's Spacecraft Rover Engineering Team, will present "Step by Step, Robotically at the Red Planet," at 7 p.m. Thursday in von Kármán Auditorium and Friday in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. Thursday's lecture will be webcast at www.jpl.nasa.gov/events/lectures/may04.cfm. For more information, call Public Services at ext. 4-0112.

Hall of Fame honorees

JPL Deputy Director Eugene Tattini salutes JPL team members whose Precision Global Positioning System Software System was recently inducted into the Space Technology Hall of Fame. From left: Dr. Michael Heflin, Dr. Willy Bertiger, Dr. Sien-Chong Wu, Dr. Stephen Lichten, Tattini, Dr. James Zumberge, Dr. Thomas Yunck, Dr. Frank Webb, Dr. Yoaz Bar-Sever. Team members not pictured: Ronald Muellerschoen and Dr. Kenneth Hurst.



Dutch Slager / JPL Photolab

Lab welcomes
thousands to
its annual showcase
May 15-16

It's not too late
to help make this
Open House
an even greater
event. If you can
volunteer a half-
day, full day or
both days, call
Public Services
at ext. 4-0112.

“Spirit of Exploration” is the theme for Open House 2004, to be held Saturday and Sunday, May 15-16, from 9 a.m. to 5 p.m. each day.

Structured around the themes of technology, Earth, Mars, our solar system and the universe, the event offers space enthusiasts and non-space buffs alike the chance to see and learn more about how missions come together.

Watch student-built robots compete and see your friends fly in space. Learn about the devices scientists use to explore our planet, from the ground below to the outer reaches of Earth's atmosphere. Or follow the water to Mars through a tour of the

Earth

Earth Science

Come see your home planet through the eyes of JPL's armada of satellites and instruments, which continuously study Earth's land, seas and sky. The images, beautiful by themselves as pieces of art, provide us with keen insights into how our Earth system ticks.

Image Processing

Learn about the unique capabilities of the nine cameras on the Multi-angle Imaging Spectro-Radiometer. See stereo and 3-D images of Earth, as well as videos and animation. Find out what this successful instrument is telling us about Earth's surface, clouds and particles in the air.

Solar System

- Check out JPL's sample-return missions, Stardust and Genesis.
- Collect planetary trading cards and ask an astronomer about the Venus Transit, happening in June.
- Learn about how Project Prometheus is making strategic investments in space nuclear fission power and electric propulsion technologies. The Jupiter Icy Moons Orbiter is the first proposed mission within Project Prometheus.
- Hear about Voyager, now the most distant human-made object in the solar system.
- Discover how the New Millennium Program “road-tests” tomorrow's technologies.
- See a model of the Deep Impact spacecraft, the first mission to look inside a comet.

Technology

Robots, Cutting-Edge Technology, New Methods

- Watch URBIE the rover and Spiderbot the robot.
- Discover the latest in optical communications, from lasers to radio frequencies.
- Check out the advanced rockets that launch JPL missions.
- Talk with engineers and scientists about the importance of mission safety and success — how JPL and NASA are lowering costs and risks of technology development for future explorers.

Microdevices Laboratory

The cutting edge of small space technology. Check out the latest in microchips, sensors and quantum infrared detectors. These help provide power and digital capabilities for instruments on many spacecraft.

Multimission Image Processing Laboratory

Experience space science data processing; view animations, 3-D images, high-definition television, and a 3-D movie with the latest images from Mars.

Special Activities

- The Mars Show: von Kármán Auditorium. Shows approximately every 30 minutes.
- Ring World: Building 167 conference room. Shows approximately every 45 minutes.
- Journey to the Planets and Beyond: Building 180-101. Shows approximately every 45 minutes.
- Solar System Walk: Take a walk through a scale model of the solar system, starting at the entrance to Open House and stretching the length of JPL.

Mars

Mars Reconnaissance Orbiter

Slated for launch in August 2005, MRO will study the martian surface and atmosphere in never-before-seen detail, returning 15 times more data than previous missions and images of objects measuring only a few feet across.

Mars Exploration Rover Mission

The twin rovers have been exploring Mars since January, and are now in an extended mission.

Odyssey and Global Surveyor

See models of the orbiters and an impressive display from their martian photo albums.

Just for Kids

Especially for school-age children. Learn about space exploration through demonstrations, audience participation and exhibits.

- Child Educational Center. Hands-on activities for pre-school-age children.
- Solar System Exploration Kids' Area. Planet tactiles, coloring, stickers of Saturn, trading cards of the planets.
- Meet Southern California high school robotic teams, then see their robots in action.
- Fly in Outer Space. Come to the JPL television studio and see yourself fly in space.
- Mars Kids' Area. Kids will have fun being “run over” by a lightweight rover and coloring their own rover.
- Planetarium. Draw your constellation and write a story for it, then it will be added to the portable planetarium.

Universe

The Search for Other Life

Is there another Earth out there? Are we alone? Come and see how future NASA missions like Kepler, the Space Interferometry

Mission and the Terrestrial Planet Finder will take us closer to finding that special planet that might have life. And explore other mysteries of deep space that give us clues about how planets, stars and galaxies formed a long time ago. See how missions like the Spitzer Space Telescope, Galaxy Evolution Explorer and Laser Interferometer Space Antenna will help answer another age-old question — where did we come from?

Cool Demonstrations

See your own face and hands transform through a heat-sensitive camera, learn how scientists experiment with weightlessness without going into space, discover why we have to put telescopes in space and why the stars “wobble.”

General Information

Parking, Lab Access

Several buildings will be used as display venues. Buildings open at least partially to the public include 167, 168, 169, 170, 180, 186, 190, 202, 230, 249, 303 and 317. Prior to the event, **staff are reminded to lock office doors and properly secure sensitive items, equipment and material to prevent theft, damage or disclosure.** In addition, personnel should challenge anyone without proper identification in closed buildings and report the incident immediately to JPL Security (4-3530).

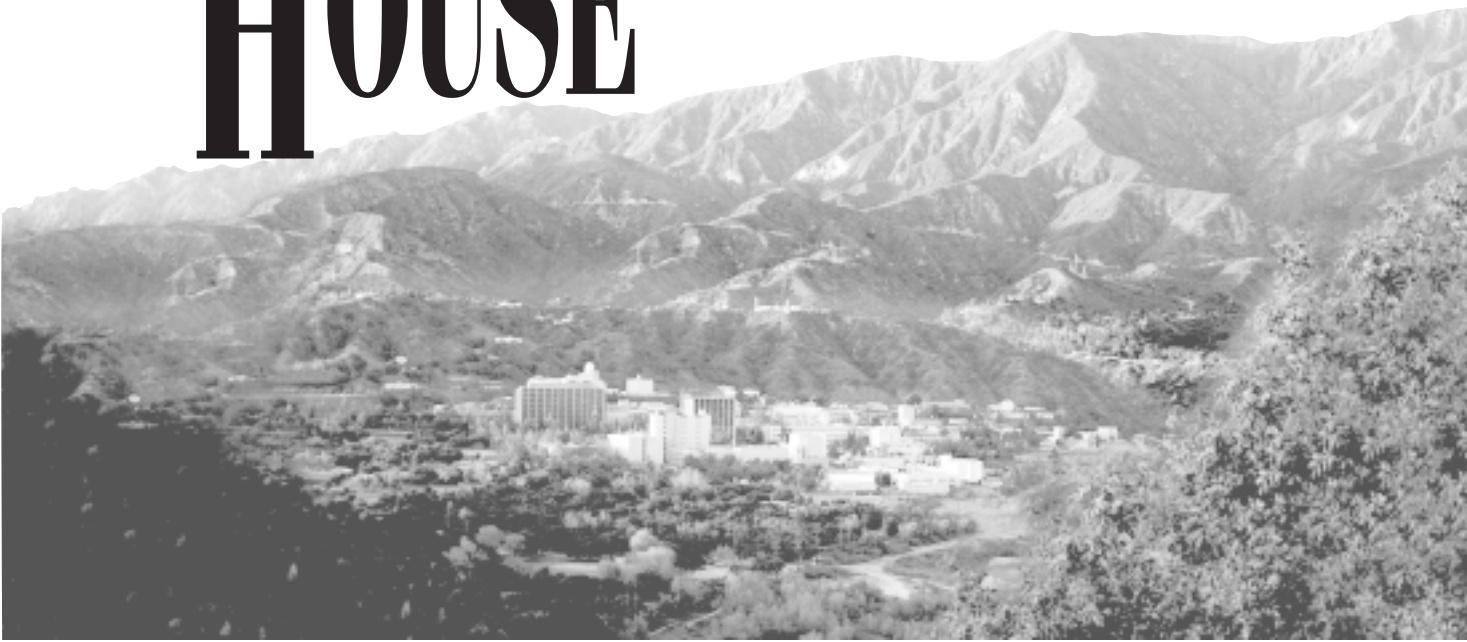
Additional security measures will be in place. Specifically, all vehicles, persons and possessions will be subject to inspection. Prohibited items include backpacks, ice chests, alcohol, controlled substances, weapons, dangerous devices, explosives, skateboards, skates, roller blades and pets (except guide animals).

The Main Gate will be reconfigured so that traffic will be restricted to outbound tour buses and emergency vehicles only. Badged employees working on the day of the event may park on-Lab but must drive through the South Gate. To maximize parking for non-JPL visitors, employees are strongly encouraged to park in lots located north of Explorer Road. Staff attending the Open House with visitors must park in areas designated for guests and enter the Laboratory through the pedestrian checkpoint at the Main Gate.

Visitors may park in the West Lot, Blue Lot (accessible from the West Lot), East Lot and Arroyo Lot. Visitors must ride parking lot buses from the East Lot and Arroyo Lot to the Main Gate. Walking in from the East Gate or South Gate will not be permitted either day of the event.

Emergencies may be reported to JPL Security by calling 911 from a Lab extension or 818-393-3333 from a cell phone.

OPEN HOUSE 2004 ON THE WAY



Team G receives honors



Passings

NORMAN SNIDER, 78, a procurement negotiator from the former Section 621, died of a massive heart attack Feb. 28.

Snider worked at JPL from 1979 to 1990. He is survived by his wife, Del, along with two daughters, four grandsons, two granddaughters and three great-grandchildren.

He is interred at Fort Rosecrans, Pt. Loma, San Diego.

DR. JOHN BLUTH, 60, a longtime JPL archivist, died April 19 in Camarillo.

Bluth joined JPL in 1992 after being a contractor for several months working on the oral history program. He remained a JPL employee until September 1998, when he moved to the contract with Sherikon Space Systems. Most recently, he consulted on a JPL Internet museum project.

Bluth is survived by his wife, Pat, and daughter Sarah. Services were held April 24 in Camarillo.

Letters

A very sincere thank you to all of my co-workers and friends who extended their congratulations and best wishes on the occasion of my retirement after 30 years. I will always appreciate the challenges and successes I shared with many of you in Division 35 during my early years and in 5X these last 19 years.

Jim Arnett

Sometimes in the turmoil and confusion following an unexpected death in the family, things are left unsaid. I fear that I may have forgotten to thank everyone at JPL for their thoughts, prayers, cards, flowers and comforting words upon the passing of my father. I can only apologize and let everyone know how much it was sincerely appreciated by myself, my brother and sister and our mother. The JPL community truly is like family. Thank you all so very much.

Kirk Gerbracht

In memory of A. Robb Frederickson, thank you, JPL, for the nice fern plant.

Christine Frederickson

Thank you to my JPL family for the outpouring of love and support in the passing of my beloved Dad. It is of great comfort to my heart to know how much others care and I seek solace in your kindness.

Sally Hughes

Classifieds

For Sale

APT. CLEARANCE, SW Pasadena, May 7-23; electric dinner bun warmer, \$7; turkey roaster, \$8; covered vegetable dish, porcelain, \$9; sleeping bag, \$10; dishes, cutlery, bedrm. items, camping items; make offers. 626/793-1895.

BED, frame, Cometa queen, cherry wood, Italian design, see at <http://www.modfurniture.com/italian.html>, paid \$1,300 new, sell \$800. 244-8822.

BOOKS: "Applied Electronics," 1943 WWII, MIT classic textbook, John Wiley publisher, \$12; Big Band Almanac, 1978, lavishly illustrated, all dance bands and singers, 1930s-'60s, 450 pgs., \$10; 626/793-1895.

BREAST PUMP, new Medela Pump-In-Style, sealed in original box from manufacturer, \$199. 909/576-5789.

COMPUTER DESK, on wheels, cherry veneer, made by O'Sullivan, model 61925, exc. cond., like new; sell for best offer. 626/449-0997.

COMPUTER, Ultra 10 Sun workstation with monitor, Solaris 8, 440MHz, 28MB/18GB, CD, \$700. 626/578-9720, eve.

CRIB, wood, made in Italy, includes mattress (height adjustable), exc. cond., photo available, \$150/obo. 626/791-6101.

DIAMOND RING, ladies, 10K yellow gold, \$90; COMPUTER, wriststop, Suunto, \$275. 897-1203, Valerie.

DESK, w/matching file cabinet & credenza, black w/brushed silver pulls, from Restoration Hard-

JPL's Team G, responsible for estimating ground data system and mission operation costs for proposals and studies, won a NASA Continual Improvement team award at the agency's recent Continual Improvement and Reinvention conference in Alexandria, Va.

On April 14, Randall Reed, the team's spokesperson, accepted the award from NASA Deputy Administrator Fred Gregory after presenting to senior NASA executives and 200 of NASA's top contractors. Reed illustrated how Team G significantly reduced the workforce required to develop accurate designs and

ware, vg quality, sturdy, \$150. 626/797-3110.

DIET TAPES, Jenny Craig, set of 14, \$25; COMPUTER POWER CONTROL CTR., 5 pwr. switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, \$20; CARD SHUFFLER, Johnson, collectible, all-metal construction w/carved-wood dowel handles, handle ~6" H x ~9" x 6", \$35. 790-3899.

EVENING GOWN, full length, peach, long sleeves with scarf/shawl, crepe and chiffon materials, sz. 16, exclusive designer, \$50/obo. 626/284-9664.

FURNITURE: 2-piece Bassett sectional (1 pc. is a sleeper), floral print; one 40" coffee table and two 26" end tables (mission style); photos avail.; all in gd cond.; \$500/obo; parts could be sold separately. 626/791-6101.

FURNITURE: office table, right-hand turn; conference room tables; sofa; chairs; sell for best offer. 626/841-8887.

GUITAR, acoustic, Estaban signed, \$200 brand new, sell for \$100/obo; PAINT PUMP, Little Pro 2500, commercial grade, no hoses or gun, \$175/obo. 249-4395 or rem@koroisland.com.

HEADBOARD/FOOTBOARD, queen, brass w/ceramic toppers, exc. cond., \$350; WATERBED FLOATATION SYSTEM with foundation, Somma, queen, \$100. 626/447-6423.

HOMEBREW EQUIPMENT: two 5-gal. Cornelius kegs with ball locks, \$25 ea.; misc. ball-lock hardware, clamps, and hoses, \$20. 323/342-9363.

MICROWAVE, white, Panasonic, \$40; SCANNER, Umax 1220P for Windows, \$15; STEREO, Sony LBT-G2000 w/3-disc CD changer, \$75; BED FRAME, queen size, \$5. 323/342-9363.

MISC: 8' pool table, Brunswick, \$500; tablecloths, 2, slate blue, oval, 18 matching napkins & rings, \$10; car creeper, Huffy, \$5; shovels, \$2 ea.; hoe, \$5; punch bowl set, 18 piece, \$10; mailbox, oversized, green, \$20; sytch (cuts tall grass), paid \$54 in 1970, sell \$10; wig, red, shoulder length, never used, \$20. 626/357-8210.

MISC: phone/answering machine, digital, cordless, Sony, \$30; speakers, Acoustic Research, \$20; Sony Discman, \$20; tuner/amp, Onkyo, \$50; Zip drive, Iomega, \$20; tensor lamp, halogen, from Ikea, \$20; golf bag, Calloway, \$20; putter, Ping, \$20; mattresses, Serta Perfect Sleeper w/box spring, twin pair, \$250/ea.; computer table from Relax the Back, \$100; grandfather clock, \$200. 213/810-8801.

ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. \$7,500, sacrifice for \$2,000; PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new, \$85; CONTROLLER CARD, Ultra ATA with cable, fits into 32-bit PCI 2.1 or 2.2 expansion slot on motherboard; brand new; \$20. 790-3899.

PASADENA SHOWCASE HOUSE OF DESIGN TICKETS, 3, for May 8, 1:30, \$30/ea. 790-2915, Dick.

PIANO, beautiful old upright, plays well, nice touch, bench, selling because we can't get into apt., \$500. 626/287-1025.

REFRIGERATOR, Kenmore Coldspot, 21.6 cu. ft., top mount freezer, like new, 2 1/2 yrs. remaining on full warranty on sealed refrigeration system, org. cost \$940, Sears 9/01, moving sale only, \$450. 240-8384.

SAXOPHONE, alto, Yamaha YAS-23 with soft case, gd. cond., \$500. 626/355-4447, John.

SECTIONAL, needs to be slip covered, frame and cushions in great condition, appx. 9' x 7', \$50; WASHER/DRYER, Maytag, \$100 each. 626/850-4378.

SECTIONAL, 3 piece, leather, corner, oyster, \$400; LOVE-SEAT SLEEPER SOFA, light charcoal, \$100. 626/355-7086.

TENTS, Sears Hillary, 9 x 9 ft., fiberglass poles, vg. cond., 2/\$80. 626/797-6982.

TYPEWRITER, IBM Selectric II, self correcting, wide carriage, exc. cond. 661/917-1569, Debi.

TYPEWRITER, Underwood, antique, with cover, works great, \$60/obo. 626/284-9664.

WASHING MACHINE, Kenmore 90 Series, 1999, good cond., \$75; SEGO PALM, 4 ft. wide, \$50; EXERCISE MACHINE, Weider, \$30. 790-2915.

Vehicles / Accessories

'98 BMW 528i, 56K mi., premium package, sport package, premium audio system, new tires/brakes, \$19,800. 395-6303, John.

'95 CHEVROLET Tahoe LT, 4 x 4, 5.7 V8, silver, exc. cond., 1 owner, 100K, auto, a/c, power windows/doors/locks, CD/cass., running boards, leather, roof rack, grille guard, towing pkg., sheepskin seat covers, LoJack, loaded, \$8,000. 368-6874.

'94 CHEVROLET Camaro, \$6,000/obo. 760/617-7004.

'93 CHEVROLET Suburban 2500, 2 x 4, 350 V8, exc. cond., well maint., low mileage, a/c, power doors/windows, wood trim dash, custom front sheepskin covers, running boards, new tires with Weld wheels, Flowmaster exhaust. 626/359-7666.

'52 CHEVROLET pickup truck, 1/2-ton, 235 cid 6-cylinder, 4-spd, gd. shape, primer gray, \$3,600. 626/794-1621, eves before 8pm, Erik.

'78 DATSUN 280Z, 2 + 2, 4 spd, silver w/black interior, exc. cond., \$4,500. 562/691-6425.

'88 FORD Taurus LX wagon, top of line, loaded, power seats/mirrors, keyless entry, etc., exc. cond., orig. beige finish, carefully maintained, 8 pass. capacity w/rear seat, \$2,900/obo. 626/798-2925.

'99 GMC Yukon Denali, 75K mi., loaded, 4WD, leather, 6-CD changer, exc. cond., \$18,000/obo. 800/937-9200, Levi or Cathy.

'04 HARLEY DAVIDSON motorcycle, custom

built, rigid, blue, 240 rear tire, 96" motor, 5-speed trans, spoke wheels, billet components, all the best, \$22,000. 626/287-1025.

'91 HONDA Accord Ex sedan, 4 cyl, auto, a/c, sunroof, all power, CD player, black ext., cream int., vg cond., \$3,200. 626/398-9836.

'98 ISUZU Trooper SUV, 4 x 4, 3.5L V6, auto, a/c, power windows/locks/heated mirrors, rear wiper/defroster, can select winter or power mode, cruise control, airbags, ABS with 4-wheel disc brakes, very roomy, lots of cargo space, only 60K, \$9,500/obo. 909/702-2326, avbattis@yahoo.com.

'94 ISUZU Trooper LS, 4D, V6, 4WD, 3.2 L, DOHC, automatic, automatic locking hubs, antilock brakes, cruise control, alarm, am/fm stereo, 12-CD player, white, exc. shape, tinted windows, new a/c, new transmission, power steering/windows/locks, tilt wheel, rear window defroster + wiper, exterior spare tire carrier, immaculate, \$5,895/obo. 957-3296.

'98 JEEP Grand Cherokee Special Ed., 5.2L V8, 4WD, 75K mi., pwr. everything, cruise contr., cass., CD, prem. sound, dual airbags, pwr. seats, moonroof, roof rack, tinted windows, tow pkg., tilt wheel, oversized tires w/new spare, prem. wheels, 4-wheel ABS, lots of after-mkt. additions, must sell, great cond., pics. avail., \$9,800/obo. 352-6646, Ben or verdugo_verde@comcast.net.

TIRES for truck, 4, 16", best offer. 897-1203, Valerie.

'00 TOYOTA Camry CE, silver, a/c, 35K mi., exc. cond., must see, \$9,500. 909/596-4302.

'00 TOYOTA Tundra Ltd., 56K mi., ABS, full power, snug top, carpet kit, tow pkg., 6 CD in-dash, new tires, \$16,500. 909/596-9007.

'92 TOYOTA Dolphin motorhome, pastel blue, slps. 5, 16 mpg, 82K mi., V6, automatic, cruise control, awning, roof & cab air, rear bath, microwave, TV antenna, innerspring matr. (not foam), linoleum floor, well-maint., manuals incl., like new inside; see photos: <http://tinyurl.com/36wtv>, \$13,500. 626/798-4510, lv. msg.

'85 TOYOTA Cressida, V6, automatic, 4 dr., runs very well, luxury, moonroof, power everything, air, am/fm radio, 157K mi., burgundy, \$2,000. 626/585-0799, Anton.

VALCO boat, Honda 9.5 HP 4 stroke motor, 12 ft., flat bottom, aluminum, both in vg cond., well taken care of, \$800. 626/398-0921.

'80 VOLKSWAGEN Rabbit, convertible, 2 dr., 5 speed, manual, runs very well, great MPG, perfect second car or short commute to the Lab, 200K, am/fm radio, white w/black roof, passes smog, \$650. 626/585-0799, Anton.

'02 VOLVO V4 wagon, only 12,200 miles, 4 cyl., 1.9L turbo, silver color, a/c, stereo/cassette/CD, dash cover, exc. cond., garage parked, all service records, \$17,490. 626/355-5631, Tim O'Donnell, 6 to 9 pm.

'96 YAMAHA Wave Ventures, matching pair on deluxe dbl. trailer, both in great shape with low hours, ready for the water, \$6,250/obo. avbattis@yahoo.com, 909/702-2326.

Wanted

APRICOTS for canning, will pick and pay. 626/285-1341, Gary.

CARPOOLER, Glendora-based, work hours 7:30 to 4:15 with stop at Woodbury, drive once a week, non-smoker, must have a vehicle that can handle 4 passengers, 4-9524, Ali.

MULAN (Disney), VHS format. 626/850-4378.

FITNESS STEP AND RISERS for step aerobics, Reebok, approx. 4 x 16 x 43". 626/345-0681.

TO RENT house or condo in/near Waikiki for Pasadena-area girls' jr. military drill team, competing May 27-31, 626/703-1619, Linda.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present, for personal use. 790-8523, Marc Rayman.

For Rent

ALTADENA "sabbatical house," 3 bd. + study, boundary Angeles Nat'l. Forest, 3 mi. from JPL (trails to Lab behind house), view, hardwood floors, fireplace, antiques, completely furnished: furniture, dinnerware, pots/pans, linens, down comforters, fine soaps, necessities included; just bring toothbrush & clothes, TV/DVD/VHS, Bose radio/CD, Dish satellite, wireless DSL available, garden, courtyard, BBQ, parking, private, immaculate, month-month. 626/798-3235.

ALTADENA house to share in historic Janes Cottage Village, 1 mi. from JPL, 3 bd., 2 ba., completely remodeled in quiet, great neighborhood; large lot w/fruit trees, gardens, etc., dogs in backyard, private rm. + ba., female pref.; \$1,000 util. inc. 626/794-8884.

ALTADENA house, .25 mi from JPL, 3 bd., 2 b.a. hardwood floor, fireplace, French doors to fam. rm., appliances, gardener incl, Jacuzzi, \$2,000. 626/798-0799.

LA CANADA, private rm in home, priv. ba., off-st. parking, BBQ, pool, full kitch, priv, wash/dry, etc., avail. 6/15, \$550 + util. 790-1280.

LA CANADA, very small room, furnished, separate from house, walking dist. to JPL from horse trail, futon, refrigerator, microwave, heat, a/c ,cable TV, private entrance w/security gate, temporary OK. 790-1893, leave msg.

PASADENA furn. apt. to share, 3 bd., 3 ba., 2-story townhome-style, cent. a/c, refrig., stove, laundry rm, patio, close to Caltech & JPL, \$625 + util. 626/429-3677 or bettyrs@earthlink.net.

PASADENA home for lease, 2 bd., 2 ba., hardwood floors in living + din. rooms, beautiful fireplc. w/hardwd mantle, remodeled kitch., laundry rm, convenient loc. on peaceful tree-lined st., nr. PCC/Caltech/Rose Parade route/ Metro Gold Line, new paint + carpet, garden-

costs, while improving cost estimate fidelity. During the past two years, Team G has adopted many new techniques and standards that promote continual improvement.

The award recognized NASA center teams that have made significant, positive impacts on their centers and the agency. A board of NASA quality management associates had selected five teams last year from nominations submitted by all the NASA centers. To nominate a team for consideration in the next competition, contact Martin Johnson at ext. 3-6060.

er, 76 N. San Marino Ave., \$1,695. 790-3336.

PASADENA, housemate wanted, easygoing, non-smoker; sm. bedrm. in 4-bd. house, walking dist. from JPL (2 blocks), central air/heat, fireplace, patio, backyd., laundry & kitchen privileges, no pets, off-st. parking, \$600 + \$300 deposit, util. included. 626/791-1768, Myr.

PASADENA, part of a beautiful home, beautiful garden setting, priv. entr., view, 1 room, bathroom & kitchenette, ideal for 1 person w/ a very quiet lifestyle, \$650. 626/798-4056.

PASADENA, share 2 + 2 + loft apt. with male near Caltech; pool, Jacuzzi, excellent gym, DSL, underground parking, security building, on-site mgmt., furnished except your bed/bath, \$650 + utilities. 626/644-5431, Gary.

PASADENA studio condo, fully furnished, 1115 E. Cordova Ave., gated facility, 2 blocks from Caltech, pool & BBQ, patio, carport, laundry, non-smoker, no pets, \$925, util. pd. except electric. 626/792-9053, Ray or Marilyn.

PASADENA, unfurn. 2 bd., 1.5 ba., 2-story townhome-style apt., central a/c, refrig & stove, laundry room, patio, parking; close to Caltech & JPL; \$1,095 + utilities. 626/429-3677 or bettyrs@earthlink.net.

SOUTH PASADENA apt., lg. 1 bd., 1 ba., new carpet and paint, 230 Fair Oaks Ave., \$875. 626/799-2625, 323/258-6868.

Real Estate

ARIZONA, 43 acres w/2-rm. house, nr. Williams, wildlife abounds, 2.5-mile access, house overlooks seasonal creek, total 127 acres, great hideaway from city, pics. at Randall. Mielke, fiji.com, \$48,000 cash or \$58,000 w/15% down, 11% interest over 10 yrs. rem@koroisland.com.

GLENDALE, Rancho San Rafael view home, 4 bd. + office, 3.5 ba., LR, FDR, family rm., spa, many extras & upgrades, community pool, tennis, rec. rm., \$1.2 million. 240-5030, owner.

Vacation Rentals

BIG BEAR LAKEFRONT luxury townhome, 2 decks, tennis, pool/spa, beautiful master bd. suite, slps. 6. 949/786-6548.

FLORIDA, New Smyrna Beach, fully furn. condo, 2 bd., 2 ba., full kitchen, 1/2-hr. to Cape Canaveral; quiet, relaxing, overlooking beach; BBQ/pool/gm. rm., great ocean view, easy walk to stores/restaurants; slps 6; weekly or monthly. 909/981-7492, Darlene or dfhaug@yahoo.com.

GREEN VALLEY lake cabin, near Big Bear, sleeps 6, furnished, cable TV, 1 bd., 1 ba., lg. living rm., fully equip'd, kitchen, fenced deck; fishing, swimming, hiking, pets OK; \$100/nt. 949/859-2237 or 323/258-4464.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps. 4, laundry fac., low season rate \$115/nite/2, high season \$130/ nite/2, \$15/nite/add'l person. 949/348-8047 or jackandrandy@cox.net.

HAWAII, Marriott's 5-star Ko Olina Beach Club Resort, Oahu; on the beach, 15 min./Waikiki, Aug. 28-Sept. 4, 2 bd. lux. suite, 2 ba., slps. 8; din. rm., fully eq'p'd kitch., oven, microwave, dishwasher, refrigerator, service for 8, built-in laundry facility, vw. TV/VCR in every rm.; 50% off - \$1,100 for 7 nts. (Marriott: \$332/ nt.); see <http://marriott.com/property/propertyPage.mi?marshaCode=HNKLO>. 790-7916.

HYATT SPECIALS: Puerto Rico, luxurious residential-style studios, furn. kitchenette, May or Oct., \$370/7 nts.; Lake Tahoe, 2 bd., living rm., full kitchen, Sep. 28 - Oct. 2, \$390/4 nts.; Colorado Rockies, 3 bd., living rm, full kitchen, Oct. & Nov., \$300/7 nts. 626/794-9579 or fivestारresorts@earthlink.net.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitch. incl. microwave, D/V, cable TV, VCR, phone, balcony w/view to mtns., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL disc'nt. 626/798-9222 or 626/794-0455 or valeriec@caltech.edu.

OCEANSIDE condo, fully furn. 2 bd., 2 ba., fireplace, full kitchen, quiet, relaxing, beautiful beachside setting; BBQ, pool/spa, game rm., grt ocean view; easy walk to pier & restaurants, slps 8; weekly or monthly. 909/981-7492, Darlene, or dfhaug@yahoo.com.

OCEANSIDE condo, beachfront, lovely 2 bd., 2 ba., single-level, deluxe, fireplace, white water ocean views, end unit, lux. gated complex on sand w/game rooms, fitness room, pools, BBQ's, Jacuzzi, 10 min. walk to pier/harbor, sleeps 6, JPL discount. 760/433-4459 or www.beachvisitors.com.

OCEANSIDE condo, beachfront, beautiful, 1 bd., 1 ba., deluxe, fireplace, garden view, luxurious gated complex on sand w/game rooms, fitness room, pools, BBQ's, Jacuzzi, 10 min. walk to pier/harbor, sleeps 4, JPL discount. 760/433-4459 or www.beachvisitor.com.

OCEANSIDE condo, on the sand, charming, 1 bd., panoramic view, walk to pier or harbor, pool/spa, game room, slps. 4. 949/786-6548.

RESORTS, 5-star; incl. Carmel, Tahoe, Sedona, Col. Rockies, Florida; lux. residential-style studios w/furn. kitchenette, starts at \$480 for 7 nts; partial weeks & 1-3 bd., w/ kitchen. 626/794-9579 or fivestारresorts@earthlink.net.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach, on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

SAN FRANCISCO, Nob Hill Inn, walking dist. to Union Square, cable cars, Grace Cathedral, financial district and Chinatown, non-smoking property, 15 miles from SFO, unit sleeps 4, one week from 7/30 to 8/6/2004 (LinuxWorld Conference week), \$600. tcf@aprelix.com.

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